Project-15

Ecology and Monitoring of Tigers in Corbett Tiger Reserve

Principal Investigators

Y. V. Jhala & Q. Qureshi
Wildlife Institute of India, Dehradun

Funding Agency

Uttarakhand Forest Department

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Introduction

As part of monitoring tiger populations in the country the Tiger Task Force recommended implementation of intensive study of source tiger populations as phase IV of the country wide exercise (Jhala et al. 2005). The intensive study should address population status, trends, demography, and study of ecological aspects that are relevant for the long term persistence and source value of the tiger population. Modern technological tools like camera traps, radio, satellite and GPS telemetry, GIS and molecular genetics should be used to address the research objectives.

Camera trapping and subsequent mark-recapture estimates has shown that Corbett Tiger Reserve probably has the highest tiger densities recorded till date, the reserve and its surrounding is home to over 160 tigers (Jhala, Gopal & Qureshi 2008). Since Corbett population is of great conservation significance and also to understand the ecology of tigers living at such high densities the current study is proposed to be undertaken.

Objectives

This project aims to:

1) Monitor the source population of tigers in Corbett tiger reserve and will address:
    i. Tiger Population estimates within select areas of the reserve
    ii. Survival and mortality information through mark-recapture study
2) Monitor Prey, Co-Predator populations, and Habitat condition in the Tiger Reserve through phase I.
3) Gain an understanding of tiger ecology - dispersal patterns, land tenure system, predation ecology, food habits and habitat use.
4) Monitor tiger movements in peripheral potential conflict zones eg. Highways and identify movement corridors for mitigation and restoration.

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Methodology

1) Population estimates of tigers have been obtained within Kalagarh, Jhirna, Dhela (Kalagarh Sub-Division), Sarpdhuli, Dhikala, Bijrani, (Ramnagar Sub-Division) ranges of Corbett Tiger Reserve using capture re-capture by camera traps during Pilot project and the country wide monitoring project (2006-2007). This population will continue to be monitored by camera trapping each year so as to estimate tiger numbers, density for each year and survival/mortality between years (Pollock et al. 1989, Karanth et al. 2006).
2) Line transects demarcated for Phase I data collection will continue to be monitored using distance sampling (Buckland et al. 1993) for ungulate density estimates, human disturbance and habitat parameters (Jhala et al 2005).
3) About 12-16 tigers will be radio tagged with GPS/VHF, GPS/VHF/ARGOS, or VHF collars and monitored for data collection on habitat use, ranging patterns and dispersal. Radio-collars will be replaced on expiry of battery life or damage on these tigers so as to get long term data from the same individuals at different life stages. Tigers are likely to disperse long distances at the sub-adult stage (2.5 to 3.5 years) or at old age (>8 years for males, and >10 years for females) when territorial residents are displaced by younger tigers. We shall deploy GPS and GPS-Satellite collars on tigers at this stage of their life cycle so as to enable us to track them over vast landscape. If budget permits we hope to use the latest technology that permits the change of GPS and Satellite duty cycles remotely so that intensive spatial fixes can be obtained at the time of dispersal to plot the dispersal route. The duty cycle would be reprogrammed to a fewer fixes to obtain traditional ecological data on ranging pattern outside of the dispersal phase and save on battery power of the transmitter. Current information on tiger dispersal is sparse (but see Smith 1993) and is crucial for delineating, designing, restoring and managing habitat corridors essential for ensuring long term persistence of meta-population structure (Hanski & Gilpin 1997, Hanski 1998).
4) Blood samples from the radio-collared tigers and tiger scat samples from the landscape connecting Corbett Tiger Reserve with Rajaji, Haldwani, and Bijnor

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will be collected and analysed to understand meta population structure and gene flow. The blood samples will also be screened for disease profiles to evaluate the prevalence of potential pathogens that can likely become episodic (eg. Cannine distemper) or cause mortality at high density through combination of stress and disease (eg. Tuberculosis).

5) The understanding and estimation of metapopulation structure, dynamics and gene flow is important in the area under study as the entire tiger landscape in the country a is fragmented with possible metapopulations across many tiger reserves, protected areas and forest land. Data for fulfilling the work will be obtained by amplifying microsatellite loci from scat DNA extracts. Scats will be systematically collected from the study area along with their Global Positioning System (GPS) reading, which will be transferred into a Geographic Information System (GIS) to establish their map location. The sampling effort would be directed to capture maximum possible genotypes, at least 70 % of the total animals in each source population. Highly polymorphic microsatellite loci sequences amplified from the scat DNA extracts will be used to generate unique multilocus genotypes, ie. DNA fingerprints of each tiger for individual identification. Thereafter various population genetic softwares, chiefly STRUCTURE 1.0 and GENECLASS 2.0 will be used to analyze the multilocus genotype data to derive estimates of the number of populations, assigning individuals to particular source populations, calculating rates of gene flow and historic bottlenecking events (Piry et. al. 2004, Pritchard et. al. 2000, Proctor et. al. 2005). Comparison of blood and scat samples from known individual tigers will assist in developing methodology for addressing allelic *dropout* rates from scat amplified microsatellite loci ad develop correction factors for such data. The methodology will also have application in individual identification of tigers.

6) Radio-telemetry and/or intensive monitoring of tiger signs along highways and human-tiger habitat interface will help identify areas which tigers use to cross from one patch of forest to another. These connecting corridors will be targeted for conservation efforts through restorative ecology and protection.

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Significance of the study

Source populations of tigers such as those of Corbett Tiger Reserve are believed to be crucial for sustained tiger occupancy and persistence in the larger landscapes. Tigers from such sources repopulate vacant habitats and sustain smaller populations through meta-population dynamics eg. Rajaji. Preserving the source value of such populations is vital for ensuring long term tiger conservation. The Tiger Task Force (Narain et al. 2005) has therefore recommended intensive monitoring of such sources so as to keep the pulse of the populations well being. The current project will serve to monitor the status, population trends, demographic structure and parameters of the tiger population of Corbett Tiger Reserve.

Demographic and genetic linkages are vital to manage populations in a landscape as a meta-population. Little data exists on habitat permeability for tigers. What land uses constitute barriers to tiger movement and what forms of land uses are compatible with tiger conservation? This information is vital for policy formulation and management of Tiger Reserve buffers and corridors for coexistence of tigers with humans in multiple use area of the landscape. Data from this project will have direct bearing on answering the above questions.

Another important conservation question is how many tigers can a reserve hold? It is a well known fact that tigers are territorial and the territory sizes are determined by prey availability (Panwar 1987, Miquelle et al. 1999, Karanth & Stith 1999, Chundawat et al. 1999). However, our preliminary data suggests that territorial male tigers tolerate several other tigers within their ranges while territorial tigresses rarely permit other tigresses to use their ranges (Jhala & Qureshi UnPub. Data). Corbett seems to defy known norms of tiger ecology with its exceptional high density population (Jhala et al. 2008). Information on land tenure system of tigers has direct bearing on delineating size and quality of Tiger Reserve Cores (inviolate spaces) for ensuring long term viability of source populations.

The research will also address the objective of understanding the genetic composition of the Corbett source population and gene flow between and within the larger landscape. This understanding is vital for managing and conserving viable corridors and also to access the risks of local extinctions of populations within the landscape.

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Budget in Rs thousands for Phase IV at Corbett Tiger Reserve

Budget Head	Details	Year I	Year II	Year III	Year IV
Researchers	2 J.R.Fs, 5 Field Assistants	336000	336000	336000	336000
Vehicle rental/POL		432000	432000	432000	432000
Telemetry Equipment	GPS/Sat Collars 16, Satellite time & accessories, Capture drugs & computer Other equipment	220000	180000	150000	
Genetic & Disease Study	Enzymes, Chemicals, Primers, Lab eqp. ELISA kits	600000	500000	200000	
TA/DA		25000	25000	25000	25000
Camera Traps	replacements to losses, film processing, batteries, other supplies		200000	250000	250000
Field expenses		150000	150000	150000	150000
Miscellaneous		50000	50000	50000	50000
Total		**1813000**	**1873000**	**1593000**	**1468000**
Grand Total					

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